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REPORT ON POLLUTION OF INTERSTATE WATERS OF THE SNAKE RIVER NEAR AND BELOW LEWISTON, IDAHO, AND CLARKSTON, WASHINGTON

G. N. Dietrich

Public Health Service
Portland, Oregon

December 1963

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by

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Sanitary Engineer

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Enforcement Activities, Pacific Northwest Office
Portland, Oregon

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FOREWORD

This report reviews the pollution of the interstate waters of the Snake River in the vicinity of Lewiston, Idaho, and Clarkston, Washington. Emphasis is placed on the causes of water pollution and on the resulting interference with legitimate water uses.

Primarily, the analytical data presented in this report resulted from a survey conducted by the Public Health Service in July and August of 1963. The purpose of that survey was to develop information to advise the Corps of Engineers on water quality changes that can be expected when impoundments constructed downstream produce a ponded condition in the Lewiston-Clarkston area. The two-fold objectives of the survey were to determine present water quality conditions and to evaluate the effect of impoundments on future water quality. The Snake River, from five miles above to 30 miles below Lewiston-Clarkston, and four miles of the Clearwater River above its junction with the Snake were surveyed. Stream samples were taken for chemical, physical, and bacterial determinations. Limited waste source sampling and sludge bed investigations were included in the survey, also.

In the preparation of this report, information has also been obtained from the Public Health Service National Water Quality Network stations on

the Clearwater River at Lewiston and on the Snake River at Wawawai, Washington. Material, information, and assistance were contributed by the following agencies:

Idaho State Department of Health

Washington State Pollution Control Commission

City of Lewiston

U. S. Corps of Engineers

U. S. Fish and Wildlife Service

This report has been prepared by G. N. Dietrich, Sanitary Engineer for the Enforcement Activities Section of the Pacific Northwest Office of the Public Health Service, Portland, Oregon.

CONCLUSIONS

Information recently collected by the Public Health Service dictates the following conclusions concerning interstate pollution of the Snake River at and below Lewiston, Idaho, and Clarkston, Washington:

1. Waste is discharged to the Snake River from several sources in the Lewiston-Clarkston area. The waste discharges from Idaho are: the partially treated municipal sewage from the City of Lewiston; the untreated industrial and sanitary wastes from Potlatch Forests, Inc., pulp and paper mill; and the untreated industrial wastes from Seabrook Farms Company pea and potato cannery. From Washington, the waste discharges are: the partially treated municipal sewage from the Cities of Clarkston and Asotin and the untreated meat packing wastes from Bristol Packing Company and Meats, Inc.
2. The significance of bacterial pollution existing in the Snake River in and below the Lewiston-Clarkston area cannot be evaluated on the basis of presently available information. Further studies are needed to make this possible.
3. The Snake River waters in Washington carry high loads of suspended solids material, primarily wood fiber, and support several areas of sludge deposits. These conditions result from the wood fibers entrained in the wastes from Potlatch Forests, Inc., pulp and paper mill in Lewiston, Idaho. The discharge of these highly colored, odorous, and turbid wastes results in damage to the aesthetic value of Snake River waters in Washington.

4. These interstate pollution problems are subject to abatement under the Federal Water Pollution Control Act. Pollution of the Snake River endangers the health and welfare of persons in a state other than that in which the discharges contributing to such pollution originate.

BACKGROUND

By definition, the Lower Snake River begins near Weiser, Idaho, and flows northward, forming first the boundary of Idaho and Oregon, and later, 37 miles of the boundary of Idaho and Washington. At Clarkston, Washington, and Lewiston, Idaho, the river makes an abrupt turn to the northwest and flows through the State of Washington to its confluence with the Columbia River.

As it flows toward Lewiston-Clarkston, the river is carried in deep, narrow canyons through high plateau country. Lowlands adjacent to the river are limited to narrow belts of land in the bottom of canyons. Population is sparse and agriculture is limited. Therefore, there is little opportunity for pollution of the Snake River before it reaches the Lewiston-Clarkston area.

The Clearwater River is an intrastate stream that flows westward through Idaho to meet the Snake River at Lewiston. Like the Snake, its valley is sparsely populated above Lewiston, and the waters reach the Lewiston area in a relatively unpolluted condition.

The Lewiston-Clarkston urban area supports a population of over 31,000, two-thirds residing on the Idaho side of the river. Asotin, Washington, with a population of 800, is located some five miles upstream on the Snake River.

The economy of the Lewiston-Clarkston area is built around the forest products and food processing industries. Potlatch Forests, Inc., at Lewiston, operates a complex of wood products manufacturing facilities that produce pulp, paper, lumber, plywood, and fuel by-products. The principal food processors are: Seabrook Farms Company, a potato and pea

processor, and Smith Frozen Foods, a pea processor, both in Lewiston, Idaho, and two meat packing firms in Clarkston, Washington, the Bristol Packing Company and Meats, Inc.

This report deals with the causes and effects of water pollution in the Snake River in the vicinity of Lewiston-Clarkston and with the lower four miles of the Clearwater River.

During the first week of the survey, average stream flow in the Snake River below the Clearwater near Clarkston was 27,060 cfs; during the second survey period, it was 23,120 cfs. Corresponding flows in the Clearwater River at Spalding were 5,465 cfs and 4,465 cfs. These are higher than the average annual low flows of approximately 18,500 cfs in the Snake River and 3,000 cfs in the Clearwater River, which occur during August and September.

PRESENT WATER USES

The Snake River in the Lewiston-Clarkston area is used for a variety of expanding recreational activities, including swimming, boating, water skiing, waterfowl hunting, and fishing. In addition to these water uses, the river serves as a migratory pathway and spawning ground for an important anadromous fishery and as a habitat for a large resident fishery.

Both Lewiston and Clarkston maintain attractive public bathing beaches within their city limits. In the summer months, each of these beaches serves approximately 200 persons per day. Water skiing and pleasure boating are popular. Several excellent small boat marinas are located on the Lewiston-Clarkston water front to support these activities.

At the confluence of the Clearwater River, the Snake River bends to the west and becomes an intrastate stream in Washington. As a result of pollution, the waters become offensive and unattractive for water contact sports. Below the Washington line, the river is used only occasionally for pleasure boating or water skiing. Attractive beaches are located in the lower section of the river.

Some use is made of the Snake River waters below the Lewiston-Clarkston area for irrigation. Spray irrigation of orchard and truck farm crops grown on the narrow bands of land in the canyons adjacent to the river is practiced.

FUTURE WATER USES

The authorized construction of Lower Granite Dam, 32 miles below the Lewiston-Clarkston area, will form a reservoir extending to and past these two cities. When completed in 1970, this impoundment will increase the water depths to some 38 feet along the Lewiston-Clarkston water front and will reduce present minimum velocities of about three to six feet per second to less than one-half foot per second. These deep, quiet waters located adjacent to and readily accessible to a major population center can be expected to support a greatly expanded participation in water-oriented recreational activities. There is good reason to believe that a sizable portion of the future recreational use will be located below both the Interstate Bridge and the several existing points of waste discharge.

WASTE SOURCES

Figure 1 illustrates the location of principal sources of wastes in the Lewiston-Clarkston area. Briefly, their sizes and characteristics are:

1. The Lewiston sewage treatment plant serves the Lewiston population of 12,000 and 1,000 persons in suburban Lewiston Orchards. This treatment plant is a modern, well maintained, and efficiently operated facility. Primary sedimentation and effluent chlorination are accomplished, with the effluent discharged to the north side of the Clearwater River, 0.8 miles above its confluence with the Snake River.
2. Potlatch Forests, Inc., operates a lumber and plywood plant, a 650-ton/day pulp and paperboard mill, and a recently constructed 50-ton/day tissue mill at Lewiston on the south bank of the Clearwater River, a short distance above its mouth. The largest portion of the liquid wastes from these facilities, including all of the wastes from the pulp and paper operation and some of the firm's sanitary sewage from a work force of 2,200 persons, are discharged through an outfall sewer to the Snake River. These wastes enter the river through a submerged, non-diffuser type outlet on the east shore of the Snake River 100 feet above the confluence with the Clearwater River. Waste retention lagoons of small size exist but are not now being used.

3. Seabrook Farms Company, in Lewiston, is a vegetable processor. Peas are packaged during a six-weeks' campaign in June and July, and potatoes for nine months of the year beginning in August. The potato processing capacity of the plant is 150 tons/day. The wastes are not treated and are discharged directly to the Clearwater River one-quarter mile above its mouth.

4. The City of Clarkston serves its entire population of 6,100 with sewage collection. The wastes collected are treated by the city's sewage treatment plant, which employs primary sedimentation and effluent chlorination. Effluent is discharged to the Snake River one mile below Clarkston. While this facility is old, it is well operated and maintained, and provides efficient primary treatment.

5. The Asotin sewage treatment plant receives the municipal sewage from its 800 population. This facility also provides primary sedimentation and effluent chlorination, but the adequacy of treatment is not known. Effluent is discharged to Asotin Creek, a short distance above its confluence with the Snake River.

6. Bristol Packing Company is located in Clarkston proper. This meat processor kills up to 50 head of cattle per day, or a maximum of 135 hogs daily. Paunch manure and grease are separated from the liquid wastes and land disposed. The wash water, floor drainage, and kill-blood wastes are not treated. These wastes are discharged directly to the Snake River.

7. Meats, Inc., processes an average of 55 head of cattle daily. As with the above firm, paunch manure and grease are separately collected and adequately disposed. Liquid wastes, including kill-blood, are not treated and are discharged to the Snake River. The cattle holding pens adjacent to this plant extend to the river's edge. Cattle are allowed access to the river and the sloping land allows unimpeded surface drainage to its waters. These constitute an additional source of wastes from this firm. Meats, Inc., is located two and one-half miles below Clarkston.

All seven of the major Lewiston-Clarkston waste sources contribute organic pollutants to the Snake River. It is customary to express the strengths of such pollutants in terms of their equivalents of raw domestic sewage, the basis for such comparison being the 5-day biochemical oxygen demand. The unit used in these expressions is the population equivalent (P.E.)[1/]. Each such unit represents the equivalent strength of the daily raw sewage contributed by one individual.

Table 1 lists the best estimates available of the organic pollution contributed to the Snake River by the waste sources of concern here. Recognition is first given to the high, total organic content of the wastes going to the Snake River, which are equivalent to the raw sewage from a population of 312,600. More than 95 percent of this organic load is contributed by Potlatch Forests, Inc., wastes. However, BOD alone does not sufficiently describe the wastes from this industry. Pulp and paper wastes from Kraft mills must also be judged as to their content of

[1/] P.E. = BOD_5 of 0.17#/cap/day.

TABLE 1

SUMMARY OF THE BIOCHEMICAL OXYGEN DEMAND
POPULATION EQUIVALENTS OF THE WASTES DISCHARGED
TO THE SNAKE AND CLEARWATER RIVERS BY SOURCES
IN THE LEWISTON-CLARKSTON AREA

Source	P.E.	Percent of total
Idaho		
Potlatch Forests, Inc.	299,000	95.6
Lewiston Treated Sewage	3,300	1.1
Seabrook Farms Company	2,300	0.7
Subtotal	304,600	97.4
Washington		
Bristol Packing Company	1,000	0.3
Meats, Inc.	1,800	0.6
Clarkston treated sewage	4,600	1.5
Asotin treated sewage	600	0.2
Subtotal	8,000	2.6
Total	312,600	100.0

biologically toxic material and solids material. With regard to the first of these, this type of wastes contains certain sulfur compounds, which in small amounts can be very toxic to fish and other aquatic life. To date, however, no fishkills have been reported, and there is not sufficient information to judge if toxicity of these wastes is presently a problem.

The discharge of solids materials from this waste source is also significant. It was extremely difficult to obtain representative samples of the plant effluent at the submerged outfall. A single sample pumped from the outfall sewer indicated that this source adds 320 tons of solid materials daily to the Snake River. Measured volumetrically after one hour of settling, it amounts to over 267,000 cubic feet per day. Roughly one-third of this, 104 tons per day, is suspended material, 90 percent of which is combustible organic matter. This composition of these wastes results from the high content of wood fibers. This fibrous material is settleable and results in sludge deposits on the river bottom. Furthermore, being organic, the sludge deposits continue to ferment after being formed. The material remaining in suspension is unsightly and damaging to the aesthetic appeal of the waters.

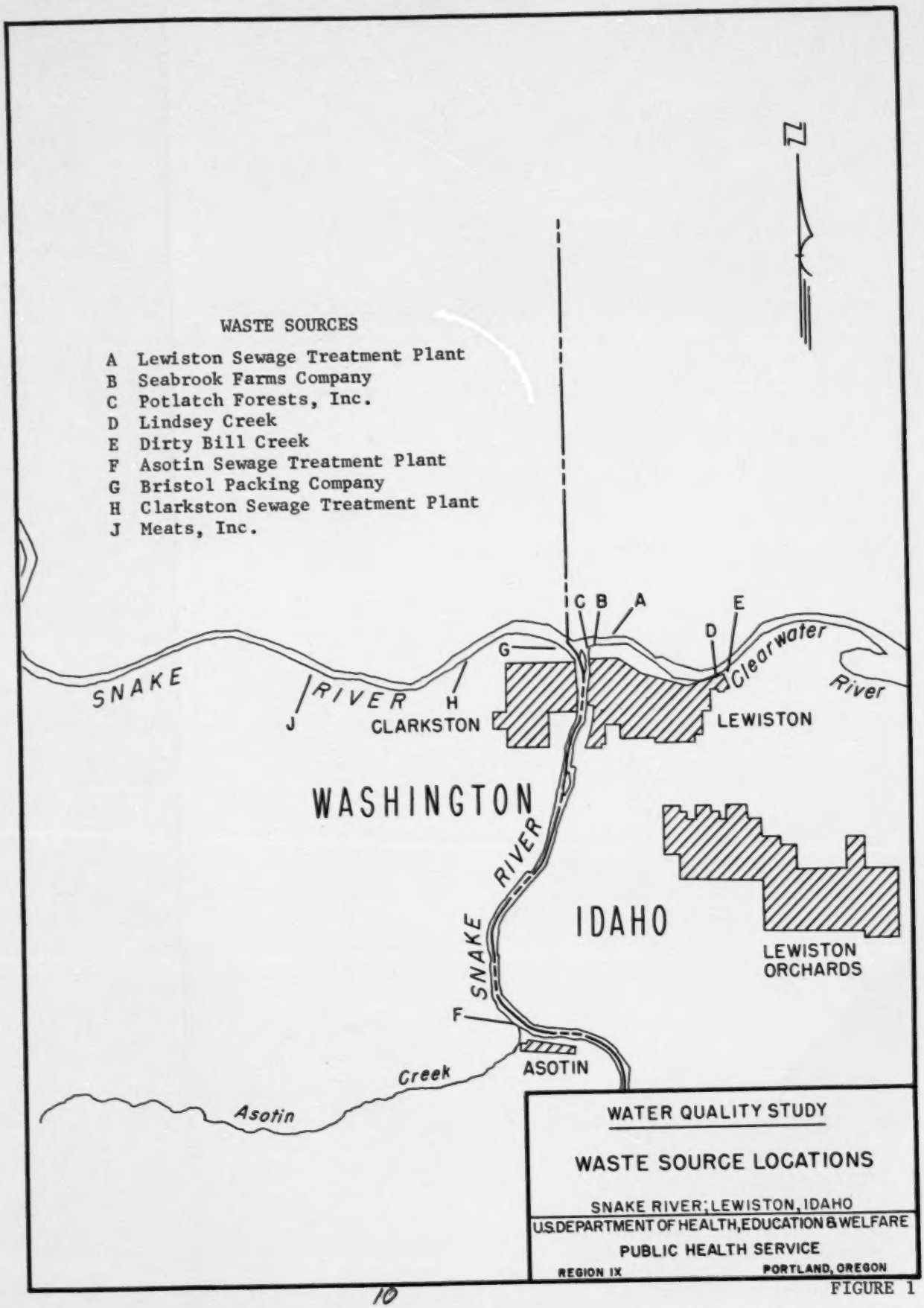
WASTE SOURCES
A Lewiston Sewage Treatment Plant
B Seabrook Farms Company
C Potlatch Forests, Inc.
D Lindsey Creek
E Dirty Bill Creek
F Asotin Sewage Treatment Plant
G Bristol Packing Company
H Clarkston Sewage Treatment Plant
J Meats, Inc.
N
C B A
E
D
G
SNAKE RIVER
J
H
CLARKSTON
Clearwater River
LEWISTON
WASHINGTON
SNAKE RIVER
IDAHO
LEWISTON ORCHARDS
F
ASOTIN
Asotin Creek
WATER QUALITY STUDY
WASTE SOURCE LOCATIONS
SNAKE RIVER; LEWISTON, IDAHO
U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
PUBLIC HEALTH SERVICE
REGION IX
PORTLAND, OREGON

FIGURE 1

PRESENT EFFECTS OF POLLUTION

Water quality data collected to date indicate that there are two pollution conditions to be considered in the Lewiston-Clarkston area. These are: bacterial pollution and damage to aesthetic value.

Bacterial Pollution

The Public Health Service water quality survey of July-August 1963 included only limited bacteriological sampling. The resulting data are at variance with earlier bacteriological data obtained by the States of Idaho and Washington and the Public Health Service National Water Quality Network. Accordingly, the significance of the bacterial pollution in the Snake River below the Lewiston-Clarkston area presently is not clear. Additional field study to fully evaluate these conditions is needed. Such study could be accomplished effectively by joint and cooperative effort by the States of Idaho and Washington and the Public Health Service.

Damages to Aesthetic Value

A rotten cabbage odor prevails in the Snake River below Potlatch Forests, Inc., waste discharge point. At times, it was difficult to separate water odors from atmospheric odors, also attributed to the pulp and paper mill. On several occasions, however, when the wind was out of the west, precluding the effects of air pollution, distinct odors of the Snake River waters were noted as far as four miles below the discharge point.

The physical appearance of the Snake River also is damaged by waste discharge in the Lewiston-Clarkston area. By decreasing their attractiveness, the uses of these waters for swimming, boating, water skiing, and fishing are interfered with.

During the latter part of the July-August 1963 survey, notes were made of the physical appearance of the Snake River in the Lewiston-Clarkston area. Generally, the Snake River above the Interstate Bridge can be described as odorless, having almost no turbidity, and very little color. Noticeably apparent in the river immediately below the Washington State line are the aesthetically displeasing odor and visual appearance of the river. These conditions are believed to be in large measure attributable to the waste from Potlatch Forests, Inc. The waste discharged from the pulp and paper mill is vividly evident as a deep brown, odorous, and turbid section in the Snake River from the point of discharge for approximately one-half mile downstream. Below that point, the waste appears to mix more effectively with the entire Snake River flow and is well dispersed when it reaches the point two miles below the Lewiston-Clarkston area. These wastes also contain a high concentration of suspended and settleable solids. During the survey, high suspended settleable solids concentrations were observed in the river for seven miles below the Potlatch Forests, Inc., outfall. Examination disclosed this material to be wood fibers.

Limited sludge bed deposit investigations involved Ekman dredge sampling in several of the pools downstream from the Lewiston-Clarkston area. Four dredgings from each sampling location were shipped to the laboratory for dry weight and percent volatile solids determinations.

As shown in Figure 2, the sludge in a pool 5.7 miles below the pulp and paper mill outfall contained 37.3 percent volatile solids. Field notes describing the visual appearance of this sample indicated that it was drawn from a well established sludge deposit. The stratified deposit

contained sludge in various stages of decomposition, ranging from black septic material to more recent depositions of fresh fibrous material. Samples from the six locations between 8.7 and 22.5 miles below the Potlatch, Forests, Inc., sewer revealed sludge deposits of lower volatile solids contents, ranging from 10.2 percent to 17.4 percent. These samples also included wood fiber material and contained sludge in various stages of decay, from brownish, less septic material, to non-decomposed fibers. These sludge deposits were found in eddies and pools along the banks of the river where velocities were very low and allowed settlement of the water's suspended load. A few dredgings were made in the higher velocity waters near the center of the channel, but no sludge deposits were found. No attempt was made to define the total extent and amount of sludge deposits.

Sludge deposits can have a number of effects on river waters from the partial elimination of bottom aquatic life, important as fish food, to the exertion of heavy demands on the dissolved oxygen resources of the waters. In this case, however, insufficient information is available to evaluate such effects.

The Bristol Packing Company and Meats, Inc., both in Clarkston, Washington, discharge blood wastes to the Snake River and create an offensive condition. The bright red discharges are vividly evident; those from the Bristol Packing Company can be seen from the Interstate Bridge. These wastes are rapidly dispersed in the river.

The unpleasant effects of odor, color, and suspended solids occurring in the Snake River waters within the State of Washington are caused by wastes originating in Idaho.

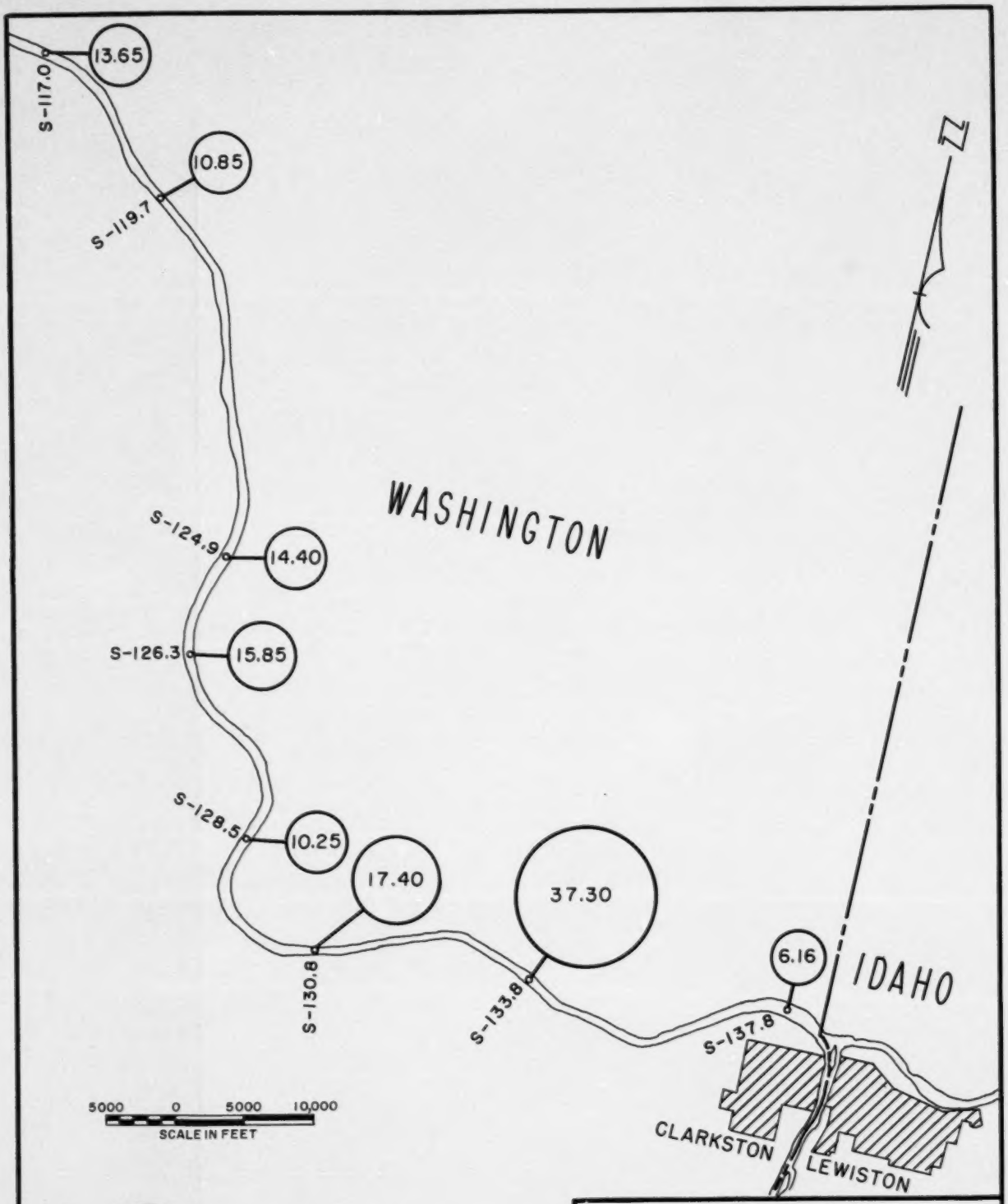
13.65
S-117.0
10.85
S-119.7
S-124.9
14.40
S-126.3
15.85
S-128.5
10.25
17.40
37.30
S-130.8
S-133.8
6.16
S-137.8
WASHINGTON
IDAHO
CLARKSTON
LEWISTON
5000 0 5000 10,000
SCALE IN FEET
17.40
% Volatile Solids in Sludge Bed Deposits
S-130.8 River Mile
WATER QUALITY STUDY
SLUDGE BED DEPOSITS
SNAKE RIVER; LEWISTON, IDAHO
U.S. DEPARTMENT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION IX PORTLAND, OREGON

FIGURE 2

FUTURE EFFECTS OF POLLUTION

The impoundment to be formed by the Lower Granite Dam will change the pollution picture in the Snake River in the Lewiston-Clarkston area. Minimum velocities will be reduced to less than one-half foot per second so that time of water passage from the Interstate Bridge to the dam will increase to more than 11 days during the summer low flow period as opposed to the present 10 hour flow time. Because of this, one-half day flow time will be required for the first three and one-half river miles below the Interstate Bridge, and wastes discharged in the Lewiston-Clarkston area will be retained for a long time in the area of future increased recreational use. Bacterial pollution can be expected to undergo regrowth to maximum densities in the river waters before passing out of this area. Thus, bacterial densities might well exceed the established limits held necessary to protect the health of the many persons who will be using the impounded Snake River waters in the future. Further, lower velocities will allow for the deposition of a major part of the suspended solids of the wastes now discharged. Sludge beds thus will be formed to the detriment of bottom aquatic life and the oxygen resources of the river. With the biochemical oxygen demand concentrations which now exist, dissolved oxygen resources of the waters passing through Lower Granite Dam very likely will be reduced to about 5.4 ppm, or 66 percent of saturation. This raises questions as to whether adverse effects on the fishery will result. Aside from these over-all pollution effects, individual waste discharges also will cause localized zones of similar but more aggravating pollution conditions by virtue of reduced mixing and dispersion.

These future pollution effects, coupled with the expected increased recreational water use, might well demand that all waste discharges receive the maximum treatment reasonably obtainable. In addition, it may also be necessary to provide diffusion-type outlets to enhance dispersion and to relocate outlets farther downstream to help eliminate high waste concentrations at points of intensified recreational use.